EPA comments to the Groundwater and Surface Water Data Summary Report
Columbia Falls Aluminum Company
Columbia Falls, Montana
Prepared for Columbia Falls Aluminum Company, LLC by Roux Associates, Inc.
Dated November 27, 2017

CFAC / Roux Associates responses are provided throughout in blue.

General Comments

Overall, the Groundwater and Surface Water Data Summary Report (GW-SW Report) is well written and comprehensive. The data collected during the first year of water sampling provides a good picture of the hydraulic characteristics, temporal variations in groundwater occurrence, contaminant distribution and seasonal variations in groundwater and surface water concentrations.

The slug test data should be presented visually on a site plan to better evaluate potential preferential pathways. One figure for each hydrogeologic unit showing the data, possibly like the thematic dot maps, should be generated.

Slug testing data presented visually on a Site plan was added to the report as Plates 11 and 12 as requested.

Specific Comments

Section 2.1 (Page 4, bullet list) – Please use the name of the stratigraphic unit at the beginning of each description. For example, bullet 1 would state:

- Glacial Outwash and Alluvium: A layer of glaciofluvial and alluvial…

Section 2.1 was modified as requested.

Section 2.2 (Page 6, 1st paragraph, 3rd and 4th sentences) –Please present more lines of evidence (i.e. hydraulic gradients, flow direction, contaminant transport, geochemistry, etc) to reinforce the continuity of the upper hydrogeologic unit in this discussion.

Section 2.2 was modified as requested.

Section 2.2 (Page 6, 3rd paragraph, 3rd sentence) – Please add to this discussion the slug test data that support the assertion that the till deposits have lower hydraulic conductivity than the overlying outwash deposits.

Section 2.2 was modified as requested.

Section 3.9 (Page 22) – Please add to this discussion the results of the waste characterization samples.

Section 3.9 was modified was requested.

Section 4.1 (Page 24, Table of Average Groundwater Elevations) – Please discuss the significance of the table in the text. What value does the table add to the discussion?

The data provided in the table is useful for understanding the magnitude of seasonal groundwater fluctuations across the Site. The first paragraph of Section 4.1 notes that groundwater elevations fluctuate seasonally at varying magnitudes depending on the area of the Site.

Section 4.1 (Pages 26-27, Table of Nested Well Groundwater Elevations; 1st paragraph on page 27) – Please calculate vertical gradients for these nested wells and discuss the magnitude of the downward gradients. Also, please explain why the groundwater elevations (GWE) for the CFMW-016/CFMW-016a well pair are not presented.

The vertical gradients were calculated and added to a table in Section 4.1. A discussion of the magnitude of the downward gradients was also added to Section 4.1.

CFMW-016 and CFMW-016a are both screened in the upper hydrogeologic unit. As noted in the text, the table shows well clusters where there is a well screened in the upper hydrogeologic unit and an adjacent well screened below the upper hydrogeologic unit. CFMW-016 and CFMW-016a, and other well clusters where both locations are screened in the upper hydrogeologic unit, were added to the table to evaluate the vertical gradient within the upper hydrogeologic unit.

Section 4.2 (Page 28, 2nd paragraph; Appendix B) – Please explain the anomalous 'flatline' visible on the CFMW-016 hydrograph from approximately 8/2017 to 10/2017. Was there a technical issue with the transducer? There are no manual GWE measurements shown during the indicated period to compare with.

The pressure transducer utilized in monitoring well CFMW-016 was placed near the bottom of the well screen, at an elevation of approximately 3071 ft-amsl. The groundwater levels between 8/2017 and 10/2017 were observed to be lower than the depth of the transducer and lower than the bottom of well screen. As a result, the transducer was out of the water during the noted time. A note was added to the hydrograph to explain there was no data during this period. A more accurate representation of the groundwater elevation during this period could be observed on the hydrograph for CFMW-016a.

Section 4.2 (Page 28, 3rd paragraph; Appendix B) – The assertions made in this paragraph, specifically that GWE fluctuations recorded in the deeper wells (screened below the upper hydrogeologic unit) were gradual, did not respond to precipitation events like the upper hydrogeologic unit wells, and that they support that the units are not in hydraulic communication is not supported by the hydrographs for wells CFMW-016/CFMW-016a which show similar GWE behavior. Please discuss this in the text. Also, please revise the final sentence of the paragraph as such: "The slower, gradual responses observed in well pairs CFMW-053/053a and CFMW-019/019a further suggests limited connectivity between the deeper unit and the upper hydrogeologic units proximal to these well pairs."

As noted on Tables 1 and 2, monitoring wells CFMW-016 and CFMW-016a are both screened in the upper hydrogeologic unit, which explains why they are responding similarly to groundwater fluctuations. This was noted in the text for clarity.

The final sentence of the paragraph was revised as requested. In addition, additional description of groundwater quality data for these two well pairs were added to this section, which further supports the limited connectivity.

Section 4.3.2.1 (Page 32, bullet list, 2nd bullet) – Please present the percentages of samples where cyanide concentrations exceeded DEQ-7/USEPA MCLs.

Section 4.3.2.1 was modified as requested.

Section 4.3.2.2 (Page 34, bullet list, 1st bullet on page, last sentence) – Please move this sentence to the discussion in Section 8.

The discussion of fluoride in Flathead Valley water supply wells was moved to Section 8.1.1.

Section 4.3.2.2 (Page 34, bullet list, 2nd bullet on page, 3rd sentence) – As above, please move the statement that fluoride concentrations in groundwater are similar to concentrations measured in public and community water supply wells to the discussion in Section 8.

The discussion of fluoride in Flathead Valley water supply wells was moved to Section 8.1.1.

Section 4.3.2.3 (Page 35, bullet list, 4th bullet, 3rd sentence) – Please clarify if the highest concentrations of aluminum, arsenic, cobalt, iron, and lead are found in the same wells as the elevated fluoride and cyanide downgradient of the West Landfill and Wet Scrubber Sludge Pond. Also, as a global comment, please refer to the 'water table monitoring wells' as 'monitoring wells screened in the upper hydrogeologic unit' for consistency.

Section 4.3.2.3 was modified to clarify that the highest concentrations of the noted metals are found in the same wells as the elevated fluoride and cyanide downgradient of the West Landfill and Wet Scrubber Sludge Pond.

The text was modified globally to refer to wells as monitoring wells screened in the upper hydrogeologic unit.

Section 4.3.2.3 (Page 35, bullet list, 6th bullet, last sentence) – Please revise this sentence to state: "In (x) of (x) samples where total zinc was detected, dissolved zinc was below detection limits."

Section 4.3.2.3 was modified as requested.

Section 4.4 (Page 37, 2nd paragraph, last sentence; Plates 7 and 10) - This statement is not supported by the Plates. Please refine the statement to discuss spatial variability in the temporal data, or remove this from the text.

Section 4.4 was modified to discuss the spatial variability in the temporal data.

Section 4.5 (Page 38, 1st partial paragraph, last sentence) –Please state the rationale for using the two different analysis packages.

Section 4.5 was modified to discuss the rationale for using two different analysis packages. It was noted that the geoprobe software allows for less manual curve matching and for monitoring wells exhibiting very slow recovering data, the curve matching functionality in Aqtesolv was preferred.

Section 4.5.2 (Page 39) – Please generate a series of figures presenting the slug test results for the two hydrogeologic units on a site plan, perhaps as thematic dot maps. This may illuminate preferential pathways and enhance the understanding of contaminant distribution and transport at the Site.

Plates displaying slug testing results for the upper hydrogeologic unit and below the upper hydrogeologic unit were added to the report as Plates 11 and 12.

Section 4.5.2 (Pages 39, 1st paragraph, last sentence; Table 18) – Please replace the average hydraulic conductivity on Table 18 with the geometric mean hydraulic conductivity. Please carry this revision into the text throughout the section.

Table 18 was modified as requested and the revisions were noted in the text of Section 4.5.2

Section 4.5.2 (Pages 40-41, Table of Hydraulic Conductivity) – As above and in Table 18, please use the geometric mean hydraulic conductivity in place of the average hydraulic conductivity.

The in-text table in Section 4.5.2 was modified to use the geometric mean of the hydraulic conductivity.

Section 5.3 (Pages 45-51; Appendix M) – Please show **all** of the screening levels used in the evaluation of COPCs on the thematic dot maps in Appendix M, and ensure that the color coding of concentration ranges is concurrent with the criteria used.

The MDEQ Circular DEQ-7 Acute Aquatic Life Standards, MDEQ Circular DEQ-7 Chronic Aquatic Life Standards, and minimum ecological screening values (ESVs) were added to the thematic dot maps in Appendix M and the color coding scheme was revised for each map.

Section 5.3.3 (Page 50, bullet list, 2nd bullet on page) – Please discuss the zinc exceedances of the DEQ-7 Acute Aquatic Life Standards.

Section 5.3.3. was modified as requested.

Section 5.4 (Page 52) – Please revise the final statements of this section. The thematic dot maps in Appendix M do show some temporal variability in concentration, albeit minor.

Section 5.4 was revised to describe the temporal variability of total cyanide and fluoride in the surface water sampling results.

Section 8.2.1 (Page 65, last paragraph) - Please add to this section a discussion of variability of concentrations just west of the Main Plant Area, south of the West Landfill, Wet Scrubber Pond and percolation ponds. For example, on Plate 7, June 2017, concentration of cyanide in wells CFMW-031 and CFMW-033 (104 and 181 ug/L, respectively) are directly upgradient of higher concentrations (i.e., CFMW-043 at 535 ug/L).

Section 8.2.1 was modified to discuss variable concentrations of cyanide in the area located around the North-East Percolation Pond and to the west of the Main Plant Area.

Section 8.2.2 (Page 65, 1st paragraph, last sentence) - Please present additional lines of evidence to support the assertion that groundwater is the source of the cyanide detected in the Backwater Seep Sampling Area.

Section 8.2.2. was modified to note that historically, groundwater in the Backwater Seep Sampling area has consistently been observed to discharge from the banks and has been sampled as part of the requirements for the Site MPDES Permit (#MT00300066). Additionally, it was noted that concentrations of cyanide up-river in the Flathead River we typically non-detect, further supporting that groundwater discharge is the source of the cyanide in the Backwater Seep Sampling Area.

Section 8.2.2 (Page 66, 1st partial paragraph on page, 2nd sentence) - Please expand the discussion of how entrained sediment may have contributed to cyanide in the Cedar Creek sample.

As noted in Section 8.2.2, Cedar Creek is not a discharge point for groundwater, and therefore groundwater is not considered to be a source of the cyanide. Additionally, Section 8.2.2 was modified to note that site topographic maps and field observations indicate storm water runoff from operational areas of the Site does not discharge into Cedar Creek, and therefore surface runoff is not considered to be a source of the cyanide. The filtered samples collected in Round 4 of sampling indicate no detections of cyanide in Cedar Creek, and therefore it appears that the likely explanation for the cyanide detections is sediment in the unfiltered samples. However, additional filtered and unfiltered samples will be collected during the Phase II Remedial Investigation to confirm.

Section 8.3.1 (Pages 66-67; Plates 7 and 10) - Please see comments regarding spatial distribution above for Section 8.2.1, and for isoconcentration contours on Plates 7 and 10. Please revise the concentration contour figures, create hydraulic conductivity distribution figures per comments on Section 4.5.2, and revise this section using the revised and new figures.

Section 8.3.1. was revised like section 8.2.1., to discuss variable concentrations of cyanide in the area located around the North-East Percolation Pond and to the west of the Main Plant Area. The concentration contours were revised on Plates 7 and 10 as requested in this comment and the comments below. New hydraulic conductivity figures are provided in Plates 11 and 12.

Table 18 – Please replace the average hydraulic conductivity on Table 18 with the geometric mean hydraulic conductivity.

Table 18 was modified as requested.

Plate 7 - Please revise September 2016 and June 2017 contours to account for lower concentration wells within the boundaries of higher concentration isolines. For example, on June 2017 figure CFMW-031 (104 ug/L), CFMW-042 (395 ug/L), CFMS-033 (181 ug/L), CFMW-029 (128 ug/L) are within the 400 ug/L contour; CFMW-044 (69.5 ug/L) and CFMW-034 (287 ug/L) are within the 300 ug/L contour.

Plate 7 was revised as requested.

Plate 10 - Please revise September 2016, December 2016, and June 2017 contours to account for lower concentration wells within the boundaries of higher concentration isolines. For example, on the December 2016 figure, the 3,000 ug/L contour should go between wells CFMW-021 (3120 ug/L) and CFMW-019 (2890 ug/L), and on the June 2017 figure the 5,000 ug/L line should encompass CFMW-027 (5160 ug/L).

Plate 10 was revised as requested.